Citation:

Brooks BM, Rajeshwari R, Nicklas TA, Yang S, Berenson GS. Association of calcium intake, dairy product consumption with overweight status in young adults (1995-1996): The Bogalusa Heart Study. *J Am Coll Nutr.* 2006;25:523-532.

PubMed ID: 17229900

Study Design:

Cross-sectional Study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the association between intake of calcium and dairy products and overweight and obesity in a biracial sample of young adults.

Inclusion Criteria:

- Participated in the 1995-1996 Bogalusa Heart Study
- Young adults aged 19 - 38 years

Exclusion Criteria:

None reported.

Description of Study Protocol:

Recruitment Young adults who participated in the 1995-1996 Bogalusa Heart Study.

Design Cross-sectional study

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

- The difference in mean daily calcium intake, daily servings of milk and dairy products, daily servings of low fat milk, daily servings of high fat milk, daily servings of low fat dairy products, daily servings of high fat dairy products, and daily servings of dishes with cheese by race and gender, BMI, waist circumference and waist hip ratio were analyzed using

analysis of variance (ANOVA)
- The effect of dairy product consumption on overweight was analyzed using general linear model and logistic regression.

Data Collection Summary:

Timing of Measurements

Measurements were taken one time only, from 1995-1996 study data.

Dependent Variables

- Overweight status in young adults measured by BMI (≥25), waist hip ratio (CDC Guidelines of >0.8 for females; >0.9 for males) and waist circumference (>88 cm for females; >102 for males)

Independent Variables

- Calcium intake and low fat dairy product consumption assessed through the Youth and Adolescent Questionnaire (YAQ), a self-administered, semiquantitative food frequency questionnaire
- Serving equivalents of dairy foods in mixed dishes were determined by a researcher at Harvard Medical School
- Food items were classified as high or low fat: foods normally consumed in amounts >30 g were considered low fat if they had less than 3 gm fat/100g and less than 30% calories from fat. Foods normally consumed in amounts <30 g were considered low fat if they had <3 g fat per 50 g and <30% of calories from fat.
- The mean dairy servings from the Pyramid Servings Database were used to calculate the number of dairy servings from each food item.

Control Variables

- Energy intake
- Age
- Physical activity was measured using a subjective rating of subjects' physical activity level outside of work using a 5 item Likert question adapted from the Lipid Research Clinic's questionnaire

Description of Actual Data Sample:

Initial N: 1306 young adults

Attrition (final N): 1306

Age: 29.7 years (mean); range of 20-38 years

Ethnicity: 952 whites, 354 blacks

- 374 White males, 578 White females
- 131 Black males, 223 Black females

Other relevant demographics:

Anthropometrics

Location: United States

Summary of Results:

Key Findings

- No significant association was found between dairy product consumption, calcium intake and overweight, defined by BMI or waist circumference
- However, there was a significant inverse association between calcium intake, low-fat dairy consumption and waist-to-hip ratio in white males.

Other Findings

- Intake of dairy products was higher among blacks than whites (p 0.05).
- Blacks had significantly higher ($p < 0.05$) intakes of high fat dairy products , and whites had higher intakes of low fat dairy products ($p < 0.05$).
- Females had statistically significant lower intakes of dairy products than males ($p < 0.05$).
- Mean intakes of low fat dairy products and calcium were significantly higher in normal weight white males than in overweight white males (defined by waist hip ratio, WHR), even after adjusting for all the covariates.
- Consumption of high fat dairy was significantly higher in overweight white males compared to normal weight white males (defined by WHR) after adjusting for energy intake, age, and physical activity.
- No significant differences were found in the intake of total dairy, low fat dairy, calcium and overweight (defined by WC) in the four ethnic-gender groups. However, overweight white males showed significantly higher ($p < 0.01$) intakes of high fat dairy products than normal weight white males after adjusting for energy intake and age, but significance disappeared after controlling for physical activity.
- After adjusting for energy intake, age, and physical activity, there was no significant association between dairy product consumption, calcium intake and overweight defined by BMI in all four race-gender groups.

Author Conclusion:

In summary, the present study suggests that intake of calcium and low-fat dairy products is inversely associated with abdominal adiposity, particularly in white males.

Reviewer Comments:

Authors note that dairy product consumption may have been overestimated due to the approach used to calculate the number of dairy servings from the mixed dishes and desserts.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes

	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes